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PRESSURIZED BOW DOME OF A CABLE-REINFORCED RUBBER CONSTRUCTION --ETC(U)  
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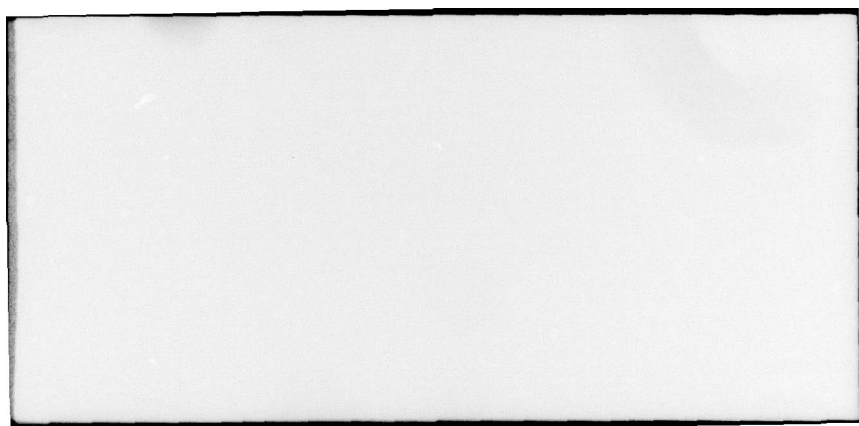
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PRESSURIZED BOW DOME  
OF A CABLE-REINFORCED RUBBER CONSTRUCTION  
FOR USE WITH AN/SQS-26 SONAR

REPAIR AND MAINTENANCE MANUAL

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## MAINTENANCE AND REPAIR MANUAL

### Purpose

The procedures outlined in this manual are to be used for repairs of small punctures in the Rubber Acoustic Window while the ship is afloat. Also, suggested procedures are given to aid in routine inspection and maintenance.

## REPAIR SECTION

### Introduction

The techniques presented in this manual were developed from simulated repairs made on a prototype test panel. The test panel, a full-scale sample of a portion of the Rubber Acoustic Window, was pressurized with water to 40 psig after each trial repair. Thus, each repair technique was proven able to withstand dome operating pressures.

Repairs may be divided into two categories: (1) Afloat and (2) Drydock.

Damage to the window requiring dry dock repairs is beyond the scope of this manual.

Damage is separated into four classes:

- A. Surface damage (does not penetrate the wall)
- B. Punctures less than 1" diameter
- C. Punctures 1" to 1-1/2" diameter
- D. Punctures larger than 1-1/2" diameter.

### Repair

Repairs afloat should be performed with the ship dead in the water and only sea head pressure in the dome. No internal access to the dome is required, nor is it necessary to pump the water from the dome.

The sequence of operations in simplified form is:

1. Stop the ship.
2. Close off the pressurization inlet and reduce the dome pressure to 8-10 psi (sea head pressure).
3. Lower a diver over the side of the ship to locate the damaged area and to determine the type of repair needed.
4. Make the appropriate repair(s).
5. Allow repair material to set 3-10 hours.\*
6. Repressurize the dome to 40 psi (operating pressure) and allow ship to get under way.

\* Cure time is dependent upon temperature. At 80°F, 3 hours are required; 7-8 hours at 60°F, and longer for lower temperatures. Do not use repair material below 50°F.



Materials and Equipment

| <u>Quantity</u> | <u>Description</u>                                    | <u>Specification</u>       |
|-----------------|---|----------------------------|
| *2              | Spatula   | 4"                         |
| *1              | Spatula   | 6"                         |
| *1              | Spatula   | 8"                         |
| *1 Set          | Grinding Stones (Conical)                             | 1/2", 3/4", 1", 1-1/2", 2" |
| *1 Set          | Grinding Stones (Cylindrical)                         | Same                       |
| *1              | Pneumatic Caulking Gun w/nozzles and cartridge blanks |                            |
| 1 gal.          | Paint Thinner (#133)                                  | Hexane                     |
| 1 gal.          | Adhesive Thinner                                      | Methyl Ethyl Ketone        |
| 1 gal.          | Paint Thinner (#134)                                  | Xylene                     |
| 1 gal.          | Concresive Solvent                                    | Toulene                    |
| *3 qts.         | Epoxy   | Concresive 1063-1A         |
| *3 qts.         | Epoxy   | Concresive 1063-1B         |
| *1              | Threaded PVC Rod                                      | 1/2" dia. x 24" lg.        |
| *1              | Threaded PVC Rod                                      | 1" dia. x 24" lg.          |
| *1              | Threaded PVC Rod                                      | 1-1/2" dia. x 24" lg.      |
| *1              | Threaded PVC Rod                                      | 2" dia. x 24" lg.          |
| *6              | Retaining Plate                                       | Steel, 6" dia. 1/4" thick  |
| *6              | Toggle Bolts  | 5/16" dia. x 4" lg.        |
| *1              | Air-Powered Rotary Buffer                             |                            |
| *1              | Pneumatic Drill and 3/16" Bit                         |                            |
| 50 ft.          | Wire Cable  | 1/8"                       |
| 4 qts.          | Cement  | Bostik #1177               |
| 1 gal.          | Anti-Fouling Paint (Black)                            | MIL-P-22298 (#133)         |
| 1 gal.          | Anti-Fouling Paint (Red)                              | MIL-P-22299 (#134)         |
| *6 sheets       | Emery Paper   | 80 grit                    |
| *1              | Lacing Tool   |                            |

\* Item in shipboard repair kit.

### Repair Procedure

**A. Surface damage (does not penetrate the wall) See Figure 1a.**

1. Buff ragged or torn edges of damaged area to a uniform smoothness approaching that of the dome itself. Use an air-powered rotary buffer with a grinding stone.
2. Mix "Concresive 1063-1".\*\*
3. Insert Concresive into damaged area using a spatula or a caulking gun. Apply sufficient amounts to mound slightly on the surface and smooth with spatula.
4. Allow Concresive material to set 3-10 hours.\*
5. Repressurize the dome to 40 psi.

**B. Punctures less than 1" diameter. See Figure 1b.**

1. Buff shallow depression (1/8-1/4" deep) approximately 3/8" over-size around the puncture.
2. Mix "Concresive 1063-1".\*\*
3. Insert Concresive into puncture using a spatula or caulking gun.
4. Drive a threaded plug which is 1/4"-3/8" larger than the hole diameter into the puncture, and mound Concresive over plug and depression.
5. Allow Concresive material to set 3-10 hours.\*
6. Buff repair to contour.
7. Repressurize the dome to 40 psi.

**C. Punctures 1" to 1-1/2" diameter. See Figure 1c.**

1. Buff shallow depression (1/8-1/4" deep) approximately 3/8" over-size around the puncture.
2. Assemble toggle bolt and plug. (See Figure II)
3. Mix "Concresive 1063-1".\*\*
4. Apply Concresive to plug, bolt, and damaged area.
5. Drive plug into puncture, using a metal collar to protect the bolt and nut from hammer blows.

\* Cure time is dependent upon temperature. At 80°F, 3 hours are required; 7-8 hours at 60°F, and longer for lower temperatures. Do not use repair material below 50°F.

\*\* See Appendix for notes on mixing.

C. (Continued)

6. Loosen nut on toggle bolt to allow toggle to snap open, then pull bolt until toggle is flush against the inside of the dome.
7. Remove nut and place 6" diameter retaining plate over the bolt. Cover the underside of the plate and bolt with Concrevice and thread the nut back onto the bolt.
8. Tighten nut sufficiently to pull retaining plate to desired contour. Cut off excess length of bolt flush with top of nut and hammer last thread to lock nut.
9. Cover nut and plate with Concrevice and allow to set 3-10 hours,\* then buff to smooth fairing.
10. Repressurize dome to 40 psi.

D. Punctures larger than 1-1/2" diameter

Around a puncture larger than 1-1/2" dia., so many supporting wire cables are cut that permanent repair at sea is not feasible. Temporary repairs, sufficient to allow the ship to return to port, can be made.

1. Drill 3/16" holes 1" apart around the puncture at least 3" from it.
2. Insert 1/8" wire cable into drilled holes and lace over the puncture in the manner a football is laced and draw the puncture closed using lacing tool.
3. Mix "Concrevice 1063-1".\*\*
4. Insert Concrevice into drilled holes and puncture, then mound slightly over surface cables using spatula or caulking gun.
5. Allow repair material to set 3-10 hours.\*
6. Buff smooth but do not expose cables.
7. Repressurize dome to 40 psi.

Any further repairs will be made in drydock.

\*Cure time is dependent upon temperature. At 80°F, 3 hours are required; 7-8 hours at 60°F, and longer for lower temperatures. Do not use repair material below 50°F.

\*\* See Appendix for notes on mixing.



## MAINTENANCE SECTION

### Retouching of Anti-Fouling Paint

During periodic or annual drydocking for cleaning and removal of marine fouling from the ships hull, the Rubber Acoustic Window should also be cleaned. If sections of the anti-fouling paint show evidence of peeling, the spots should be hand buffed with fine grit (80 grit) emery paper. Buff the area until all loose paint is removed and the rubber surface is exposed.

**CAUTION:** Be careful not to buff away more than 1/16" of the rubber.  
Buff rubber to a faired, smooth contour.

When fouled areas have been cleaned and buffed, the surface must be prepared for coating with anti-fouling paint. The painting procedure is:

1. Insure that the rubber is dry.
2. Damp-wipe exposed rubber surface with a cloth soaked in hexane solvent.
3. Apply "Bostik" #1177 cement. Thin with one part methyl ethyl ketone to two parts 1177 by volume. Allow to dry for four hours.
4. Apply three spray coats of MIL-P-22298 (#133) black anti-fouling primer. Thin with one part hexane to two parts #133 paint by volume. Allow one-half hour drying time between coats.
5. Apply five light spray coats of MIL-P-22299 (#134) red anti-fouling paint. Thin with one part xylene to one part #134 paint by volume. Allow one-half hour drying time between coats.

### Interior Inspection

The dome should be emptied at least once every 12 months and allowed to dry for interior inspection.

The inside surface of the Rubber Window should be visually inspected for surface irregularities such as blisters, cuts, and peeling of cover patches. These should be repaired using the "afloat" procedures. The zinc plates should also be examined to insure adequate surface area is available (per Navy standard requirement).

The bolt locking system on the window clamps should be thoroughly examined to determine if any of the locking-rod welds have broken loose. If any bolt locks are not secure, the bolt torque should be checked and adjusted to the proper installation torque (250 ft-lbs min.) before rewelding lock-rods.

Upon completion of the inspection, any areas of the bead clamp-bolts and clamps not covered by vinyl paint should be repainted.

### Exterior Inspection

The anti-fouling paint and the entire surface of the dome should be visually inspected for surface irregularities, such as pits, gouges, cracks, etc. Minor surface damage should be repaired by the same techniques designated for afloat repairs.

### APPENDIX

#### Procedures for "Concresive 1063-1"

##### A. Mixing

Pre-measured quantities of 1063-1A and 1063-1B are most easily mixed by kneading together on an open pallet with a spatula. Mix thoroughly for 3-5 minutes. The ratio of quantities is: 100 parts "A" to 113 parts "B" by weight, or 3 parts "A" to 4 parts "B" by volume.

##### B. Application

The Concresive should be applied with gloved hands. It may be necessary to hold it in contact with the wet surface for about 10-15 seconds to obtain good adhesion. An alternate method of application is to spread the mixture onto fabric or tape and apply the Concresive by rolling in place leaving the fabric or tape intact until the cure cycle has been completed.

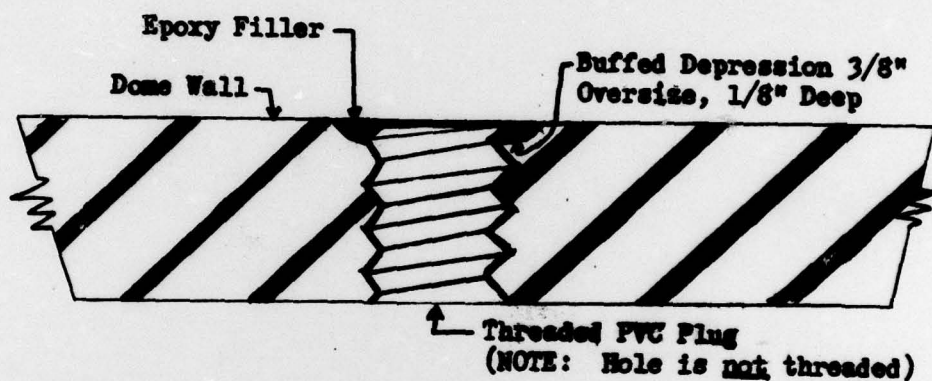
##### C. Cleaning

Tools may be cleaned with toulene before the Concresive has set. The only practical method of removing cured Concresive is soaking for 1-3 days in methylene dichloride.

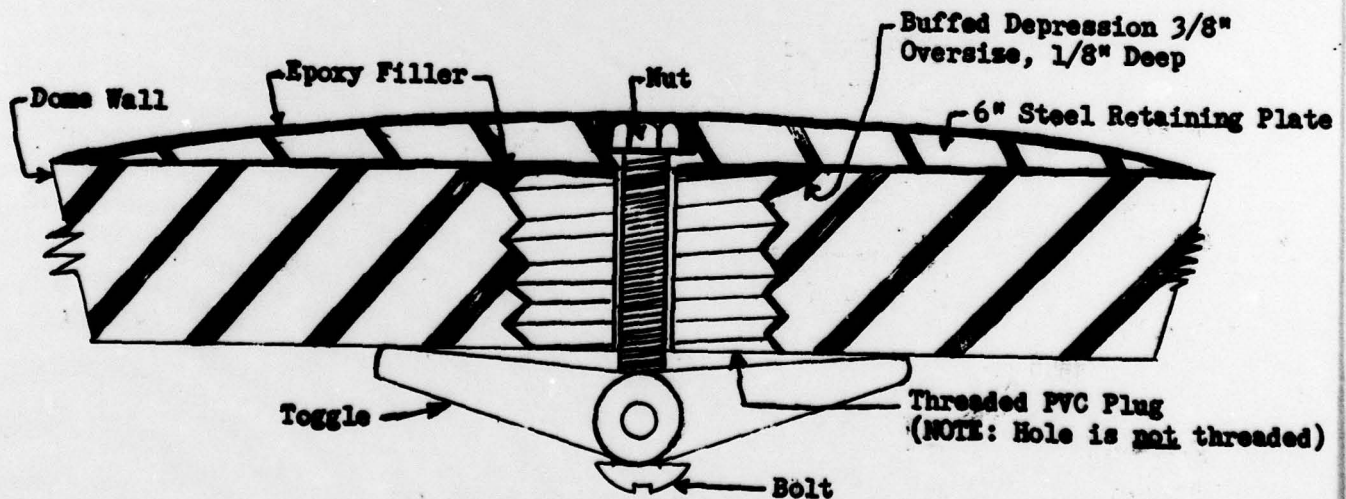
Concresive is not known to be toxic, but skin contact should be avoided. Barrier creams and skin cleansers, such as Kerodex 71 or Indco Labs Nos. 211, 212, or 214 are recommended. Wash skin thoroughly with soap and water following any contact.



a. REPAIR OF MINOR SURFACE DAMAGE



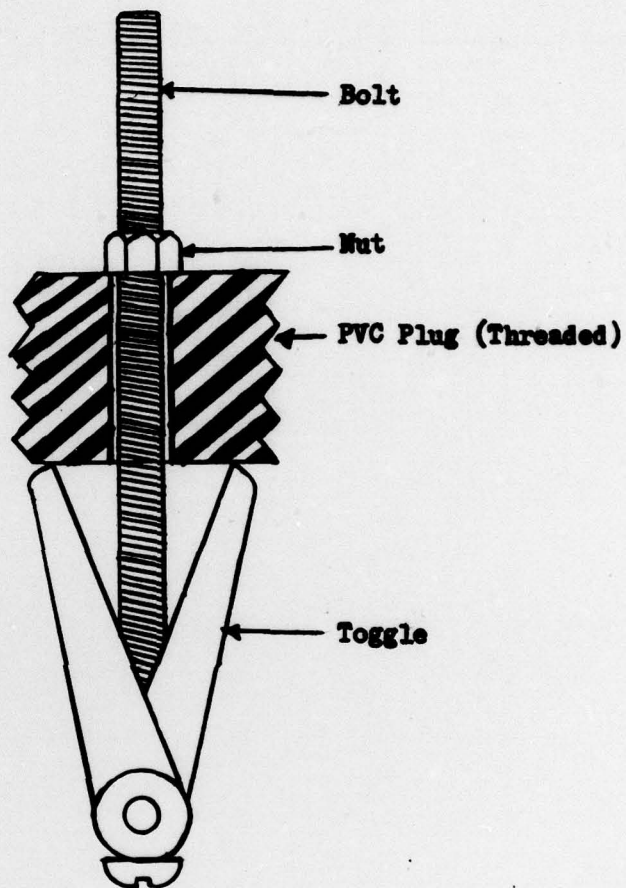
b. REPAIR OF PUNCTURE LESS THAN 1" DIA.



c. REPAIR OF PUNCTURE 1" TO 1-1/2" DIA.

FIGURE I





**FIGURE II**  
**TOGGLE BOLT AND PLUG ASSEMBLY**